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ALASKA

FROM

THE WESTERN RANGE—A GREAT BUT NEGLECTED NATURAL RESOURCE

FOREST SERVICE

U. S. DEPARTMENT OF AGRICULTURE

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ALASKA

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In 1867 the United States purchased from Russia the vast territory then known as Russian America but now designated as Alaska.

Despite an occupancy covering more than three-fourths of a century, the Russians left the country in much the same condition as they had found it—an unbroken wilderness. General colonization was not fostered and the white population was confined almost exclusively to the officials and employees of the fur company which was the dominant factor in the affairs of the Territory. Operations were confined chiefly to the exploitation of the sea otter and seal of the coastal waters and the upland furbearers of the coastal areas. These activities involved little use or even exploration of the great land mass.

American sovereignty brought no abrupt change. For three decades the white population was inconsiderable, and it was not until the great gold rushes, around the turn of the century, that white men became well dispersed over the country. The placer-mining activity brought many thousands of men into the Territory but the excitement subsided after 10 or 15 years, and the majority of the goldseekers departed. Although gradually increasing for the past 20 years, the present number of inhabitants, white and native, equals only one person to 10 square miles. Most of the population is concentrated in coastal towns and villages and is employed in industrial enterprises involving little land use.

There has thus been no extensive development and use of the available land resources to date. In interior and arctic Alaska, however, the white occupation brought with it continuous devastation by fire of timber, grass, and tundra cover which are needed to support the varied and abundant existing wildlife and to provide a basis for future increased settlement. There has also been some serious deterioration of range lands on portions of the Bering Sea coast through overgrazing by reindeer.

Present conditions in Alaska with respect to the land resources are comparable to those which prevailed in the West 60 or more years ago, before the great tide of western settlement was well under way.

To avoid mistakes similar to those made in connection with the development of the West and to correct existing bad practices, a program of protection and planned use should be initiated at an early date for those extensive public-owned resources of Alaska which have not yet been brought under careful management.

GEOGRAPHIC AND PHYSICAL FEATURES

Alaska has an area of 586,400 square miles. It is one-fifth the size of continental United States and nearly equals in extent the

Rocky Mountain States of Montana, Wyoming, Colorado, New Mexico, and Arizona. Though it forms the northwest extremity of the North American continent, only one-fourth of its area is north of the Arctic Circle. Its position with regard to latitude is about the same as that of the Scandinavian Peninsula and the town of Seward on the south coast is located on about the same parallel as Oslo, Norway.

The Territory can easily be classified into four geographic divisions (fig. 87), as follows:

Arctic slope.—The Arctic slope includes all lands draining into the Arctic Ocean north of the Seward Peninsula. Its southern limit is the high Brooks Range and some lower mountains to the west which together form the divide between the Yukon and Arctic drainage areas. The topography of the Arctic slope consists of a broad low-lying area along the shores of the Arctic Ocean which is gradually succeeded by rolling ridges and steep slopes as the crest of the Brooks Range is approached. The size of this division is 114,460 square miles.

Interior.—The interior division extends from the Arctic divide on the north to the crest of the Chugach Mountains on the southern coast. It includes the large drainage areas of the Yukon River and Kuskokwim River, the high Alaska Range in the central part of the Territory, and the region between the Alaska Range and the Chugach Mountains which drains south, through breaks in the Chugach divide, to the Pacific Ocean. Aside from the steep slopes of the three mountain ranges mentioned, this region is one of high plateaus, ridges of moderate slope and height, and broad flat valley floors. In the Yukon and Kuskokwim drainages the plateau section gives way, in the western or lower river sections, to the Yukon-Kuskokwim Delta, a very wide strip of marshland across which the two rivers flow to reach Bering Sea. The size of this division is 373,465 square miles.

Southern.—The southern division consists of the coastal strip south of the crest of the Chugach Mountains and west of Meridian 141°, the Alaska Peninsula, Aleutian Islands, and the Kodiak Island group. The mountains extend to the shores of tidewater and the topography is very rough. The area is 62,915 square miles.

Southeastern.—The southeastern division⁵² is composed of the narrow strip of mainland and adjacent chain of islands lying east of

⁵² Southeastern Alaska is the most accessible and populous section of the Territory, and appears to offer the best opportunity for an early and material expansion in economic development. Its population in 1930 was 19,304 of which 12,877 were whites and the remainder native Indians. It has dense forests of the western hemlock-Sitka spruce type and the volume of standing timber on the Tongass National Forest is estimated to be 78.5 billion board feet. An important local sawmill industry is located in this region, but the timber resources are primarily valuable as raw material for a prospective pulp and paper manufacturing industry. Under proper forestry practices the timberlands of this region can produce approximately 1,000,000 tons of newsprint paper each year in perpetuity.

The principal existing industries are fishing, mining, and lumbering. The agricultural possibilities are small because of the steep topography, wet weather during the growing season, and the difficulties of clearing the densely forested lands. Home gardens are very productive.

The only extensive open lands consist of wet "muskegs" (peat bogs) within the forest areas, and grass and brush areas above timber line. With few exceptions these lands are more valuable for the support of game animals than domestic stock and will continue to be so used.

Deer and black bear are well distributed and quite numerous. Grizzly bears are found on the mainland areas and the big brown bear on three of the principal islands. A management plan has been provided for the big brown bears on Admiralty Island, one of the three islands indicated above.

The Glacier Bay National Monument of 1,820 square miles is located in this region. Its outstanding feature is a group of tidewater glaciers, but the area is also a bird and wildlife sanctuary.

meridian 141° and extending southeast from the main body of the Territory for 400 miles along the west side of British Columbia. This is strictly a region of rough, rugged topography. The area is 35,560 square miles. This section of the Territory has been included in the Tongass National Forest, the resources of which are now under adequate administration. The forest area is 25,900 square miles.

The present account of Alaskan land resources deals primarily with the main area of the Territory, i. e., with the Arctic, interior, and southern sections and excludes southeastern Alaska.



FIGURE 87.—Alaska is equal in size to the Rocky Mountain States—Montana, Wyoming, Colorado, New Mexico, and Arizona. With the exception of the 35,560 square miles in the southeastern region, practically all of the Territory is suitable for the use either of wildlife, reindeer, or domestic livestock.

CLIMATE OF THE MAIN AREA

The Territory has a wide range of climate. Arctic conditions prevail in the extreme north, the interior compares with the prairie Provinces of Canada, and the whole Pacific coastal strip, with its moderate winter temperatures and heavy precipitation, bears a striking climatic resemblance to the coast of British Columbia, Washington, and Oregon. The high range of mountains lying parallel and adjacent to the southern coast blocks progress inland of the warm moisture-laden winds from the Pacific, and consequently interior

Alaska has a light precipitation and the low winter temperature typical of lands of its high latitude.

The Arctic region has a mean temperature of 38° to 45° F. in summer and -16° to -10° F. in winter. The annual precipitation is approximately 6 to 8 inches. Interior Alaska areas have short, warm summers, with mean temperatures ranging from 50° to 58° F., and long winters, with mean temperatures between 0° and -20° F. The annual precipitation is between 7 and 20 inches. In the southern region the mean temperature for summer is between 50° and 55° F., and for winter from 20° to 35° F. The rainfall varies between 50 and 190 inches. Much of the ground in the interior and Arctic regions is permanently frozen to bedrock. In the interior region the surface ordinarily thaws to a depth of 18 to 24 inches during the summer months, but with the removal of the usual dense ground cover of moss the soil gradually becomes free of permanent frost to much greater depths. No permanently frozen ground is found in the Pacific coastal strip.

Permanent icefields and glaciers, though prominent features of Alaska, cover only a small percentage of the land area, and are largely limited to the mountain system along the south coast and to the slopes of the high Alaska Range.

POPULATION

The population in 1930 of the main area of Alaska consisted of 15,763 whites and 24,211 Indians and Eskimos—total, 39,974. The Arctic slope north of Seward Peninsula accounts for 2,857 of the above—118 whites and 2,739 Eskimos.

The number of persons living in towns and villages of more than 250 inhabitants was 12,050 of both races.

The gainful workers of both sexes and all races was 18,201. The principal classes of employment were mining, fishing, trapping, farming (general, fur, reindeer), lumbering, and the service industries supporting the workers in these activities.

LAND STATUS

Title to the lands of Alaska is almost entirely in the Federal Government. Perhaps not to exceed 1 percent of the area has passed to private ownership. Portions of the Federal lands have been withdrawn from private entry under the public-land laws and are administered for specialized purposes, but the greater part of the Territory remains in the status of open public domain.

Following are the principal withdrawn areas⁵³ on which protection and planned use of the land and its vegetative-cover resources are given consideration:

Chugach National Forest—area, 7,533 square miles—located on the southern coastal strip of the main body of the Territory; held primarily for continuous timber production. All of its resources are given protection and are subject to use under appropriate restrictions.

⁵³ Excluding southeastern Alaska.

McKinley National Park—area, 3,030 square miles—located on the Alaska Range in interior Alaska; reserved primarily for its scenic features. All of its land and cover resources are given protection. Is a bird and wildlife sanctuary.

Katmai National Monument—area, 4,275 square miles—located on Alaska Peninsula; a bird and wildlife sanctuary; reserved to give protection to its unique physical features.

Aleutian Islands Bird and Wildlife Refuge—covers all of the islands of this chain, including Unimak Island on the extreme east. All forms of bird and wild animal life are protected.

LAND AND COVER RESOURCES—THEIR SOCIAL AND ECONOMIC VALUE

VEGETATION

The narrow strip of country south of the crest of the mountains on the southern coast and west to Cook Inlet is characterized by forests of the type, designated as the coast forest, that occurs as a narrow coastal belt from southern Alaska to Oregon. With this exception the vegetative cover types of the Territory are those which commonly prevail throughout the sub-Arctic and Arctic sections of the North American Continent.

THE COAST FOREST REGION

The western hemlock-Sitka spruce forests are composed of dense stands averaging 15,000 to 20,000 board feet per acre of valuable saw timber. A dense understory of brush, with blueberry predominating, is usually present, and the ground is blanketed with a thick mat of moss. The timber cover is broken at frequent intervals by brush patches and muskegs. The altitudinal limit of tree growth varies between 1,000 and 2,500 feet above sea level. Above these elevations the forest is succeeded by brush, grass, and herbs. The mountain tops, above 4,000 feet, are usually bare. Due to the humid climate of this region, the vegetative cover has suffered little from fire. The sections of this region in which timber predominates are largely included in the Chugach National Forest.

INTERIOR FOREST REGION

The most prevalent type of the so-called interior forest, lying north of the coast forest region, is a mixture of white spruce and Alaska white birch with northern black cottonwood a frequent associate. It occupies the better-drained soils of valley floors, benches, rolling ground, and the lower slopes of the high ridges. Growth is very slow. The white spruce reaches a larger size than the other species but rarely exceeds 18 inches in diameter and 50 to 60 feet in height. The type most frequently occurs as open woodlands. Stands of sufficient density to be classed as forests are common but seldom continuous over extensive areas.

The altitudinal limit of the white spruce-white birch type may be as high as 2,500 feet or more above sea level for the region as a whole, but in many places, because of adverse local conditions, it is much lower.

A second forest type occurs on the wet lowlands. The trees are short and gnarled, rarely exceed 6 inches in diameter, and occur as scattered individuals or in small groups. The predominating species is black spruce, but stunted tamarack, white spruce, and Alaska white birch are frequently present, especially on patches of somewhat better-drained soils.

Open stands of aspen occur on steep, dry slopes and thickets of alder and willow on valley floors.

Both the dense and fairly dense timber areas carry a moderate growth of brush and a deep ground cover of moss and lichens. The open stands of timber have a heavy growth of brush, principally ground birch and alder. The very extensive wet lowlands support dense stands of low willows, other shrubs, lichens, and herbaceous growth. The better drained soils of the river bars and benches are covered with grasses and weeds.

From timber line to elevations between 4,000 and 5,000 feet the cover is composed largely of brush and lichens. The grasses do not occur widely here. This high range is of greater forage value than the range below timber line.

The forest zone of the main area of the Territory extends north to the south slope of the Brooks Range and west to Norton Sound, Bethel on the Kuskokwim River, and the base of the Alaska Peninsula. No satisfactory estimate of the actual acreage within this zone covered with forests is available, but a conservative guess places the extent of the dense and open woodland stands at between 100,000 and 125,000 square miles, or 64 to 80 million acres. The average stand per acre is probably about 7 cords giving an estimated total volume of between 448 million and 560 million cords.

NONFOREST REGIONS

The nonforest sections consist of grasslands and tundra. The principal grassland areas are the Alaska Peninsula, Aleutian Islands, Kodiak Island, and some nearby small island groups. This portion of the southern Alaska coast is beyond the western limits of the western hemlock-Sitka spruce forest and the lower slopes of the prevailing mountainous lands are clothed with a dense, waist-high growth of grass and herbs from tidewater to high elevations. Low-lying lands at the heads of bays carry heavy stands of beach grasses and sedges. Thickets of stunted alders are found in scattered patches in the bottom of ravines and other protected spots.

The tundra area lies to the north and west of the forest region. It includes the vast strip of low-lying land comprising the Kuskokwim-Yukon Delta near the shores of Bering Sea, the rolling lands which constitute Seward Peninsula, and the whole of the Arctic slope.

The tundra cover is composed of sedges, dwarf shrubs, lichens, mosses, weeds, and grasses. Wet and dry tundra are recognized as separate vegetative types based on a difference in the composition of the species but both form a full cover and have high forage value. The rocky ridges have a more open and dwarfed cover. Thickets of tall willow occur along many of the streams, and scattered patches of alder and birch are found in the valleys and on upper slopes.

No surveys have ever been made to determine the extent of the cover types of Alaska. The estimated areas of the zones in which

each of the principal cover types predominates are given below merely as an indication of the area of the types. The estimates do not exclude barren areas within the outside boundaries of the zones.

	<i>Square miles</i>
Western hemlock-Sitka spruce forest zone (west of meridian 141°)---	7,500
White spruce, birch forest zone-----	337,925
Tundra zone-----	150,000
Alaska Peninsula-Aleutian Island grassland zone-----	55,415
Total of main area ⁵⁴ -----	550,840

The maintenance of the vegetative cover of the forest, grass, and tundra lands is essential to the present and future welfare of Alaska. The social and economic development of the greater part of the Territory, both present and potential, is largely predicated on farming, mining, reindeer grazing, cattle and sheep raising, and the use of the abundant wildlife. The extent to which these activities can be maintained and expanded is dependent in large measure on the protection and proper use of the cover resources.

The agricultural areas are situated in the forested sections and the pioneer Alaska farmer must draw constantly and heavily on the local forests for fuel, building materials, fencing, and many other uses. He also needs grass and browse cover as forage for domestic livestock. The mining industry uses the local forests extensively. In many localities they are the only source of fuel and timber needed in mining operations. The reindeer herdsman and cattle and sheep raisers are even more dependent than the farmer and miner on the maintenance of the vegetative cover for a livelihood. The prospector, trapper, fur rancher, and, in fact, everyone who is engaged in any outdoor pursuit in this pioneer region is dependent in many ways on one or a number of items comprising the cover resources.

Growth in the interior forest is so slow that even under good protection and management it may fall short of fully supplying the timber needs of the future local population. Little of the interior timber will ever come into the general timber-products markets. Birch trees of the best quality are suitable for cabinet-making and may be removed from some of the more accessible areas, such as around the head of Cook Inlet, for shipment to Pacific Northwest factories. In the distant future some of the more accessible white spruce may be shipped south for pulp manufacture.

Game animals and fur bearers which occupy a highly important place in the economy of Alaska cannot exist without cover. Its value as food supply to the carnivores is indirect in that it is required by the rabbits, rodents, and other small animals on which the carnivores prey.

AGRICULTURE

The existing and potential agricultural areas of Alaska are estimated to be 65,000 square miles. The principal agricultural localities cover portions of the main valleys of the Tanana, Kuskokwim, and Yukon Rivers in the Interior Plateau region, and the Matanuska Valley and the west side of Kenai Peninsula in the vicinity of Cook

⁵⁴ Exclusive of southeastern Alaska with 35,560 square miles composed largely of western hemlock-Sitka spruce forest cover.

Inlet. The better agricultural lands usually occur on the low benches and on moderate slopes at the bases of the ridges but occasionally on valley floors. They are not continuous over extensive areas but are broken by patches of little agricultural value.

The crops now being raised consist largely of spring wheat, oats, barley, peas, vetch, potatoes, carrots, and rutabagas. Quickly maturing strains of the three grain crops first mentioned have been developed to meet the climatic conditions of the region. Oats, brome, and vetch are the main hay crops. Dairying is an important feature of farming because of the high local demand for dairy products.

The soil of the coastal strip south of the Chugach Mountains is capable of producing good garden crops but has little value for agriculture owing to the cool, wet weather during the growing season and the expense of land clearing.

The 1930 census showed the total number of farms in the Territory, outside of southeastern Alaska, to be 298 and the improved area of farm land 6,270 acres. The total number of livestock in the region at that time was approximately 6,800 sheep, 1,400 cattle, and 300 horses.

REINDEER GRAZING

Reindeer were introduced into Alaska from Siberia to provide the Eskimos with an additional and more dependable source of food supply than the game and fish on which they had previously and almost exclusively relied. Between the years 1891 and 1902 a total of 1,280 animals was placed on Seward Peninsula in the general vicinity of Bering Straits and from this original stock have grown the present extensive herds with an estimated yield of 1 million animals. The industry is confined almost wholly to the tundra areas of the Territory and herds are now found in the coastal areas of Bering Sea and the Arctic Ocean from Kodiak Island and the Alaska Peninsula on the south to Point Barrow on the north. Tundra lands are peculiarly well suited to reindeer grazing owing to the presence of a suitable forage cover and the ease of herding. Also, the population of northwest and west Alaska is largely concentrated along the coast, and the industry has logically developed on the nearby range which is almost exclusively tundra.

The animals furnish a wide variety of products. The meat is used for food, the offal from butchering for dog feed, and the skins for winter clothing for local use as well as for fine leather. Reindeer are used to some extent in Alaska as a means of transportation, but seldom as milk animals.

Reindeer raising has become an established industry carried on by both Eskimos and whites. The number of animals has increased far beyond the local needs, and meat, hides, and other products are now sold in the general American markets.

The animals are raised on the open range and herded to prevent straying. They are grazed throughout the year and rely entirely on the range food supply. The practice in the industry is to confine each herd to a separate natural topographic unit which comprises both summer and winter range and has fawning grounds as well as buildings, corrals, and other necessary improvements.

The reindeer is closely related to the wild caribou and intermingling of the two classes of animals produces losses to the herd.

owner in the straying away of reindeer with the caribou. Inter-mingling is also undesirable because the caribou as a game animal should be kept pure in strain. The coming of the reindeer industry thus requires the sacrifice of the caribou on the same range and this necessitates the elimination of caribou from the coastal areas of the Bering Sea and Arctic Ocean.

Examination of the range conditions in localities where reindeer grazing has been carried on for some years shows a great need for effective range management. In many cases great damage has been done to the cover, and range specialists state that from 15 to 40 or more years are required to bring back to depleted lands the lichens that are so important to the industry.

CATTLE AND SHEEP RAISING

The agricultural areas of the interior and the Cook Inlet localities, because of forage conditions as well as market demands, are better suited to dairying and to cattle raising as a feature of general farming than to large specialized stock-raising enterprises.

The grasslands of the Alaska Peninsula, Aleutian Islands, and Kodiak Island appear to be well suited to the raising of cattle and sheep on an extensive scale and eventually large sections of these lands will doubtless be brought into use by the livestock industry. Favorable features include the heavy forage cover, a long grazing season due to the relatively mild winter climate, and the possibility of harvesting the extensive stands of beach grasses and sedges for hay and silage. The attempts made to date to establish the industry here have not been very successful, owing in large part to inadequate transportation facilities for reaching the more populous parts of the Territory and the cities of the Pacific Northwest, but it is anticipated that this disadvantage will sometime be eliminated.

Important waterfowl and wild game sanctuaries are located in the grassland sections of the Territory. Grazing privileges may have to be withheld or specially restricted on some of these sanctuaries.

WILDLIFE

Alaska is rich in wildlife resources and is recognized as one of the outstanding game areas of the world for wilderness animals. The game contributes to the food supply and the furbearers to the cash income of isolated local inhabitants, but the greatest value of the wildlife to the Territory results from its being an attraction to hunters, naturalists, photographers, painters, tourists, and other visitors. The local economic benefits are not, however, the only reason for keeping the Territory well stocked. The general public of the United States, with a stake in the federally owned lands of Alaska, is interested in maintaining abundant wildlife resources as a recreational feature for public enjoyment.

After making a liberal allowance of lands for the further expansion of the reindeer, agricultural, and stock-raising industries there remains a vast area with a vegetative cover that can be utilized profitably for the support of a large and varied wildlife population. Also, lands to be used later for the industries mentioned above can provide support for wildlife until needed for these other purposes.

The notable big-game animals of the Territory include the group of huge bears known as the Alaska brown bear, various species of the grizzly bear group, the polar bears of the Arctic seas, moose, and white mountain sheep. Other valuable wild animals are caribou, black bear, glacier bear, mountain goat, Sitka blacktail deer, and rabbits. Breeding grounds for wild ducks, geese, and a multitude of other migratory birds are found on the shores of the Arctic Ocean and the Bering Sea. Upland game birds include ptarmigan and grouse. The fur-bearing animals include black, silver, gray, blue, and white foxes, the martin, beaver, otter, mink, ermine, muskrat, and wolverine.

The Alaska brown bears, of which the Kodiak bear is the largest individual species, are the largest carnivorous animals in the world. They occur on the islands and in the coastal sections of southern Alaska from southeastern Alaska to the Aleutian Archipelago, and have a range of not less than 100,000 square miles. The grizzly bears, close relatives of the Alaska brown bear, are found over most of the Territory. These two groups of bears are of outstanding interest to big game hunters and students of wildlife. They are fairly numerous and are thought to be increasing in numbers as the result of good enforcement in the past 15 years of the law against the sale of pelts. A careful estimate of the number of Alaska brown bears on Admiralty Island in southeastern Alaska, made in connection with the establishment of a bear-management plan for the island, showed a population of 900 on the island area of 1,664 square miles, or 1 animal to 1.85 square miles. The stocking on this island is doubtless somewhat heavier than on the range as a whole.

The moose closely follows the brown and grizzly bears in public interest. It occurs throughout most of the timbered section of the Territory. Kenai Peninsula, east of Cook Inlet, has the largest specimens of moose and an unusually heavy concentration of animals.

The white mountain sheep is found in large numbers along almost the full length of the Alaska Range, over great sections of the Brooks Range, and in parts of the Chugach and Kenai Mountains on the south coast. The steady increase in the number of rabbits in recent years has been beneficial to the sheep in that its natural enemies—wolf, coyote, and lynx—now have this alternate source of food.

The caribou is the most numerous of all Alaska big-game animals. Various estimates of the population of the five more or less distinct herds which are recognized are around 1 million. It is widely distributed throughout the high country of the interior plateau region, Alaska Range, and Brooks Range, and along the full length of the Alaska Peninsula. While the caribou is not highly prized by big-game hunters, its occurrence in vast numbers in the wilderness areas, its migrations, and other equally interesting features add greatly to the pleasure of visiting sportsmen and tourists. It constitutes an important source of food supply for the pioneer in the isolated sections of the Territory. The caribou, in fact, occupies a position in Alaska quite similar to that occupied by the bison in the Western States, and both sentiment and economic considerations dictate that it should be maintained in large numbers.

Black bears are found throughout most of Alaska, except in the treeless regions. Glacier bears are confined in the mountain system of the southern coast.

Mountain goats are found in the mountains of the southern coast eastward of Cook Inlet, and north to the Wrangell Mountains.

Deer, while abundant in southeastern Alaska, do not occur naturally on the main area of the Territory. Several years ago some small islands in Prince William Sound were successfully planted with deer, and good-sized herds are now found in that locality.

Snowshoe rabbits and Arctic hares abound in most sections of the Territory and are again on the increase. The rabbit population is subject to violent but regular fluctuations with the peak being reached about every ninth year. In the years of greatest concentration they often jeopardize the supply of browse required as winter feed by game animals, but, on the other hand, their increased number constitutes an enlarged food supply for most of fur bearers.

The fur bearers of the Territory are widely distributed and reports of game and fur wardens indicate that the number of animals is now on the increase. Such increase is probably due to lessened trapping during the business depression and to the present large rabbit population. By furnishing employment with a cash return to many local inhabitants both white and native, the fur bearers are an important economic resource for a pioneer country in which the opportunities for earning cash are restricted. Fur farming, especially the raising of foxes, has become an industry of some importance. The value of the furs shipped from Alaska from 1912 to 1934 was \$39,600,000.

Migratory waterfowl breed in large numbers on the extensive tundra and marshlands, particularly of the Arctic Slope, Yukon Delta, Yukon Flats, islands of the Bering Sea, and the Aleutian Island chain. These nesting grounds contribute to the supply of birds using the Mississippi flyway along the main drainage of the Mississippi River, the central flyway of the high plains and Rocky Mountain region, and the Pacific flyway which leads directly down the Pacific coast.

Migratory waterfowl are in the front rank of wildlife resources and unfortunately the supply of birds over the vast interior section of the United States has become greatly depleted, owing to the destruction of breeding grounds as a result of the drainage of shallow lakes and marshes for agricultural use and the widespread drought conditions which prevailed in the 5 years following the 1929 nesting season. The nesting grounds of the northern and northwestern sections of Alaska have thus become of increasing importance in the maintenance and replenishment of the bird supply in these more southerly regions.

The nesting grounds of Alaska are excellent. They are well watered and possess the equally valuable feature of remoteness. The human population of the major wildfowl localities is small and there is little danger of any material increase in human encroachment in the near future. The only adverse feature of importance is the occurrence of wolves and coyotes which prey on the birds and eggs. Measures to control these predatory animals are badly needed.

PREDATORY ANIMALS

The principal predators are coyotes and wolves. Wolves have long been troublesome, but only recently have coyotes become a serious problem in Alaska. Coyotes have been spreading to the northwest in North America for many years, and they first entered the Territory about 25 years ago, but as late as 1925 they were not an important factor in game losses. They are now very numerous and occur as far as Point Barrow to the northwest and Kenai Peninsula to the southwest. They are preying heavily on caribou, fur bearers, mountain sheep, upland birds, and on nesting waterfowl on the northwestern coast.

The Biological Survey carried on control activities in Alaska in the period 1927 to 1931, but terminated the work on the latter date because of lack of funds. A bounty is offered by the Territory on coyotes and wolves, but this control measure has not proved highly effective in reducing or even holding in check the number of these animals.

FIRE

The outstanding menace to wildlife, reindeer grazing, stock raising, and agricultural development, except in the humid south coast region, is the depletion of the vegetative cover by fire. The effects of fire far transcend in importance the combined results of all other agencies which work toward the depletion of the valuable land resources of the Territory. The scant precipitation, the high proportion of daylight hours combined with warm weather in the summer months, and the occurrence of a continuous matlike ground cover of vegetation constitute a high fire hazard. Not uncommonly a fire will rage for many weeks and extend over hundreds of square miles before being checked by natural barriers such as rivers or by the coming of the fall rains.

In one specific instance noted, a fire that started in the spring was still burning in September. A fire in the Illiamna Lake region at the base of the Alaska Peninsula, which was reported in June 1935 by airplane pilots as constituting a menace to air travel due to the smoke, had then been burning for 2 weeks and had advanced 50 miles. In the same summer a fire in the Kvichak River section, burning for more than 2 months in brush, grass, tundra, and scrub timber, covered an area estimated at 1,000 square miles in a region formerly teeming with wildlife of every sort. Numerous fires, many of which have been burning unmolested for long periods, can be seen in the course of a trip during the summer months along any main route of travel.

The most accessible localities, such as those around settlements and along roads, trails, and navigable rivers, have suffered the greatest fire damage and exhibit extensive areas of continuous burn and large tracts that have been almost denuded as the result of repeated fires.

This devastation goes on year after year in almost every section of the Territory north of the Pacific coastal strip and has been a serious matter since 1900, at least. No satisfactory estimates can be made of the extent of the damage done to date, but it is safe to say that tens of millions of acres have been fire-swept at least once, and much of this area two or more times, in the past 35 years. As long ago as 1915 an interested observer estimated that fires had covered an average of

1 million acres a year in the preceding 20 years. The slow growth of much of the vegetation in this sub-Arctic region, especially lichens and the principal tree species, results in an exceedingly slow recovery of the burned-over areas.

Fires in Alaska are almost wholly man caused (lightning being a negligible factor) and are due in large measure to a lack of appreciation of their damaging effects on the vegetative cover and hence on the enterprises which this cover helps to support. Hunters, prospectors, wood cutters, and all classes of travelers leave behind them live camp fires and mosquito smudges which frequently lead to extensive burns. Fires used in land-clearing operations for cabin sites, homesteads, and placer mining are often set with no thought of preventing their spread to the surrounding wild lands. In fact, a majority of persons who travel, work, or live on the open range handle fire in a casual way that indicates a failure to realize that unrestrained burning is draining away a large share of the resources on which the Territory is dependent for its continued well-being. The past few years, however, have witnessed a considerable change of sentiment in this matter. Increasing visual evidence of the fire damage to resources, the objection of tourists to the smoke pall which obscures the scenery, and the interference of the smoke with airplane travel are all factors that work in that direction. The last-named is important, as air transportation is widely used in Alaska. It is believed that, with aggressive leadership, a predominant sentiment against fire could soon be obtained.

FEDERAL AGENCIES IN CHARGE OF LAND AND COVER RESOURCES

THE DEPARTMENT OF THE INTERIOR

The Department of the Interior administers practically all the lands of the main area of Alaska, the exceptions being the Chugach National Forest and a few areas of relatively small size. The Mount McKinley National Park and the Katmai National Monument are in charge of the National Park Service of this Department, but the great bulk of the lands have the status of open public domain and thus come under the supervision of the General Land Office. It is the open public domain that is subject to the high fire risk, is suffering the heavy losses, and has suffered such losses over a period of 35 years.

The fire-protection efforts of the Federal Government on the open public domain at this time are almost negligible. The General Land Office in recent years has been employing a few men temporarily during the fire season for protective work in the vicinity of some of the larger towns. The Government-owned Alaska Railroad takes steps to prevent and suppress operating fires along the right-of-way. Any additional measures taken are very limited in scope or restricted to small areas.

No serious attempt has ever been made to provide adequate fire protection on the open public domain of Alaska. Good results can be obtained only through the formulation and conscientious application year after year of a broad, well-considered plan of organ-

ization and operation. If such a plan had been initiated by the Federal Government for these Alaska lands between the years 1905 and 1910, when the national forests of the Western States were being brought under planned protection, and had the plan been carefully followed thereafter, the cover resources would still be almost intact on millions of acres that are now fire swept.

THE FOREST SERVICE, DEPARTMENT OF AGRICULTURE

The Forest Service administers the Chugach National Forest of 7,533 square miles on the southern coast of the main body of the Territory. Three-fourths of the forest has a light fire risk due to the humid climate. In the remaining portion, in a zone of fairly high risk, the Forest Service has maintained an efficient system of fire protection for the past 25 years.

BIOLOGICAL SURVEY AND ALASKA GAME COMMISSION

The Department of Agriculture, acting through the Biological Survey, has charge of the protection of game animals, land fur bearers, migratory waterfowl, and upland game birds. Its field of activity does not include the protection from fire of the cover on which this wildlife is dependent. In addition to regulatory work the Biological Survey makes scientific studies of wildlife and wildlife conditions, establishes game animals on empty ranges, carries on predatory animal control projects, and makes extensive scientific investigations of the reindeer industry and of fur ranching.

The local regulatory agency of the Biological Survey is the Alaska Game Commission, which was established in 1925. This Commission, the membership of which is appointed by the Secretary of Agriculture, consists of five men, one from each of the four judicial divisions of the Territory, and an executive officer who is the representative of the Biological Survey in Alaska. The Commission commonly meets once yearly. It proposes for action by the Biological Survey and the Secretary of Agriculture such regulations as seem advisable with respect to hunting seasons, bag limits, establishment of game and fur districts, and designation of lands as refuges. It formulates general plans for regulatory work to be carried out under the direct supervision of the executive secretary, and makes recommendations for action by the Biological Survey on such matters as predatory-animal control, the restocking of game lands, the introduction of new game species, and the study of wildlife problems.

The Territorial government has no responsibilities in connection with the protection of Alaska wildlife.

RECOMMENDATIONS FOR ACTION

Adequate management of the cover resources of Alaska lands will require the establishment and application of a program of varied and related activities. The following are the most important considerations: Protection from fire must be given the vegetative cover; better protection against predators must be extended to the wildlife resources and domestic range animals; specific areas should be dedi-

cated to the specific types of use for which they are best fitted; suitable restrictions should be placed on the use of resources on lands which are not to be patented; scientific studies are needed of problems affecting the resources and their dependent industries.

Fortunately the demands of the existing situation in Alaska can be met quite satisfactorily by the comparatively simple measures hereinafter proposed.

SURVEY OF THE PLANT COVER

A comprehensive study of the cover resources of the lands of the open public domain is needed as a basis for providing the various resources and their dependent activities with integrated systematic plans for protection and management.

In connection with this study the vegetative-cover types of the open public domain should be mapped on broad lines. The cover conditions and especially the extent and degree of fire damage on many large areas are little known. The mapping project should cover first those localities of primary interest in connection with the establishment of plans for a fire-protection system, controlled grazing, predatory animal control, and game management. The field data can be obtained most quickly and at least expense by means of aerial photographic surveys.

An early start on the protection and land-planning program is so desirable that in case delay is encountered in the general mapping project, the program should be initiated on the basis of cover data now available, or readily obtainable by the usual reconnaissance methods.

The suggested aerial photographic survey of vegetative cover might well be combined with a similar survey of topography for the use of other branches of the Government and particularly the United States Geological Survey. Through such an arrangement the cost of the work to the agency especially concerned with the vegetative cover should not exceed \$50,000 per year for a period of 5 years.

FIRE PROTECTION ON THE OPEN PUBLIC DOMAIN

The establishment of a fire-protection organization on the open public domain is an essential first step in any attempt to bring the public-land resources under a reasonable degree of control. The executive head of the project should be sympathetic with its objectives and experienced in the broad aspects of administrative work in fire protection. The organization should be represented in each of the larger community centers throughout the regions of high fire risk, but the initial forces of each headquarters might well be limited to the key men around whom a larger field force is later to be built, and one or two assistants. Most of these men should be yearlong employees. The key men should be of proven ability in establishing fire-protection systems, including ability to promote favorable public sentiment, and effect cooperative agreements with public and private agencies for the prevention and suppression of fires.

Educational efforts directed toward fire prevention would constitute one of the major functions of the organization and be especially

important during the first few years. With a population in the fire-susceptible regions of not to exceed 32,000 or the equivalent of one person to 16 square miles, an opportunity exists for highly effective educational work through frequent personal contact. Close association should be maintained with miners, mining companies, transportation agencies such as air transport, river steamer, and stage lines, sportsmen's organizations, and, in fact, all classes of workers and agencies having activities in the open country.

Cooperation in the prevention, reporting, and suppression of fires should be arranged among the many Federal and Territorial agencies having widespread representation throughout the country, such as the Alaska Road Commission, Alaska Game Commission, Alaska Railroad, and Bureau of Indian Affairs. The cooperating public agencies will, as a whole, be able to carry a large part of the burden of fire-protection work if given competent direction and some financial assistance by the fire organization.

During the initial stages of the fire-protection administration the keymen should make a detailed study of the fire conditions of their respective districts. The fire organization should not be materially expanded or incur the expenditure of large sums for detection and suppression equipment until these studies and the experience of the keymen have indicated the size and character of the fire problem and how it can best be met. On the basis that the keymen and their principal assistants would be employed throughout the year, the cost of the work during the first 3 or 4 years should not exceed \$60,000 per year.

REINDEER GRAZING

A study should be made of the range needs of the reindeer industry, following which the industry should be allotted a definite portion of the open public domain. Reindeer grazing should be restricted to this allotment. This action will effect a segregation of reindeer and caribou and thus protect the purity of the strain as well as the food supply of both classes of animals. Both reindeer and caribou are highly important in the economy of Alaska, and each is entitled to an equitable share of the range lands of the Territory. The reindeer allotment area should be based on the location and size of the present industry, the possibilities for expansion, and the need for a combination of range features for each herd. Interested public agencies have considered this problem and tentatively selected an area embracing approximately 100,000 square miles in the form of a wide strip along the coasts of Bering Sea and the Arctic Ocean.

Within the reindeer area, plans for range management should be perfected which will provide for the proper use and protection of the range resources, including the recovery of those lands which have already suffered from overgrazing. Definite grazing areas should be allotted each herd.

This activity will require a small permanent supervisory force composed of men of training and experience in grazing-land administration. The cost will be approximately \$50,000 per year.

DETERMINATION OF AGRICULTURAL AREAS

The localities of highest agricultural value on the open public domain should be determined with proper weight being given to all of the factors involved, including accessibility and available markets. While homestead entry should not be restricted to these localities, their advantages should be pointed out to prospective farmers. Action along the above lines should tend to concentrate agricultural settlement on the better areas, with resultant economic and social benefits. Such classification work will need the cooperation of the agricultural division of the Alaska University at Fairbanks.

The sum of \$25,000 per year for a period of 5 years should be made available for this project.

PREDATORY ANIMAL CONTROL

A permanent program of intensive predatory animal control, with special reference to coyotes and wolves, should be put into effect at once. The distribution of coyotes throughout most of the Territory, including the isolated breeding grounds of waterfowl on the shores of the Bering Sea and Arctic Ocean, will necessitate widespread control work. A permanent force of well-trained men should be built up for this work as rapidly as possible. An allotment of not less than \$50,000 per year will be needed to start the activity.

GAME-MANAGEMENT AREAS

For the purpose of having wildlife contribute more fully to the economy of the Territory, lands of outstanding value for the more desirable species of game animals should be officially designated as "managed hunting grounds" or "game-management areas", and a game-management plan should be provided for each of such areas. The plan should afford special and intensive treatment to the area and its game with the object in view of maintaining a numerous game population and improving the hunting conditions. The work will call for close cooperation between the Federal agency having supervision of the cover resources of the open public domain or other publicly owned lands involved, and the Alaska Game Commission.

Satisfactory game management will involve an expenditure of not less than \$75,000 per year.

WILDLIFE REFUGES

An intensive study should be made of the possible need for additional wildlife refuges and for adjusting the boundaries of existing refuges. It may be found that the best results can be obtained by the use of numerous relatively small refuges rather than a few large ones, or by supplementing the existing large refuges with additional small ones. A study of the refuge situation with respect to the big brown and grizzly bears is especially desirable at this time.

EXPERIMENT STATION

There are many problems connected with the growth, protection, and utilization of the forest and range resources which require the intensive, systematic, and persistent study which can be best provided by an experiment station. A forest and range experiment station similar to those maintained by the Department of Agriculture in continental United States should be established in Alaska. The headquarters station should doubtless be located at Juneau in southeastern Alaska and branches would be needed in interior Alaska, the tundra region of the northwest coast, and the grassland areas of the Alaska Peninsula and Kodiak Island.

The operation of the station and its branches will involve expenditures totaling \$100,000 per year. In addition, buildings and other station improvements will cost \$25,000 yearly for the first 5 years.

INTEGRATED ADMINISTRATION

The administration of the cover resources of the open public domain of Alaska should be based on an integrated program of Federal activity, under which fire protection and the conditions or restrictions to be set up to assure proper use, will be brought into harmony with the varying requirements of wildlife, reindeer, cattle, and sheep, and other interests which are dependent on the cover for existence. A satisfactory program will be difficult to establish and carry out under the present system of Federal administration, which places responsibility for fire protection and use of the cover in the Department of the Interior while giving the Department of Agriculture the responsibility for studying the cover requirements and promoting the welfare of the above-mentioned interests. Different viewpoints of the two Departments with respect to the things necessary or desirable to be done or the degree of stress to be given each of several activities would doubtless result frequently in no action being taken, or at least in delays. For example, studies by the Biological Survey, Department of Agriculture, of the best methods to employ in reindeer grazing to avoid or check depletion of the range vegetation can be of little value if the facts determined are not used as a basis for restrictions in the use of the range by herd owners.

A more satisfactory accomplishment would be possible if the administration of the forest, tundra, and grass resources of the open public domain were transferred to the Department of Agriculture. This Department has a greater official interest in the protection and proper management of resources of this type than any other Federal agency and the problems involved in Alaska are of the same general character as those which receive the attention of the organization and personnel of this Department throughout the United States.

